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B65D 83/14

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B8N NKB N503

(56) Documents Cited

GB 2312418 A	GB 2307224 A	GB 2216872 A
GB 2195986 A	EP 0692434 A2	EP 0642992 A2
US 5169038 A	US 4842168 A	

(58) Field of Search
UK CL (Edition P) B8N NKB
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(54) Abstract Title
Metering valve

(57) This invention relates to metering valves for pressurised dispensing containers.

A metering valve for use in a pressurised dispensing container for dispensing a product, the metering valve comprising a valve stem (1) having an outlet duct (9). The valve stem (1) is co-axially slidable through an annular metering chamber (13) defined between the valve stem (1) and the cylindrical chamber body (2). The metering valve further comprises an inner seal (5) operable between the valve stem and an inner end portion of the chamber body (2). The valve stem (1) being slidable from a rest position, in which the metering chamber (13) is chargeable and in which the outlet duct (9) is sealed, to an operative position in which the contents of the metering chamber (13) are dischargeable in use by the outlet duct (9). Wherein the valve stem (1) has a substantially constant diameter with flow channels (17) for supplying, in use, product to the metering chamber (13) defined within the valve stem (1) such that the inner seal (5) is supported by the valve stem (1) at all times.

FIG. 1.

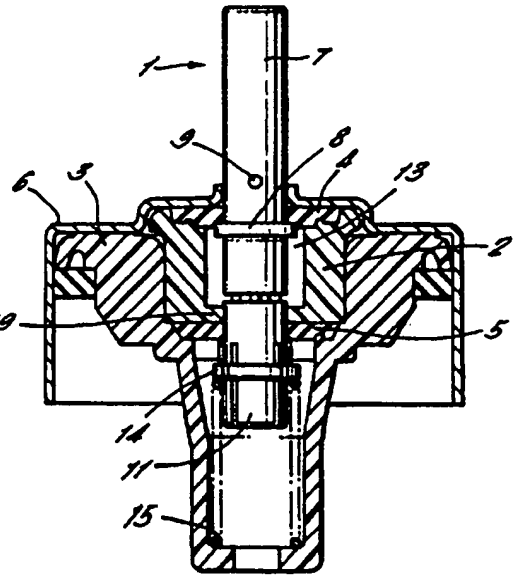

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FIG. 1.

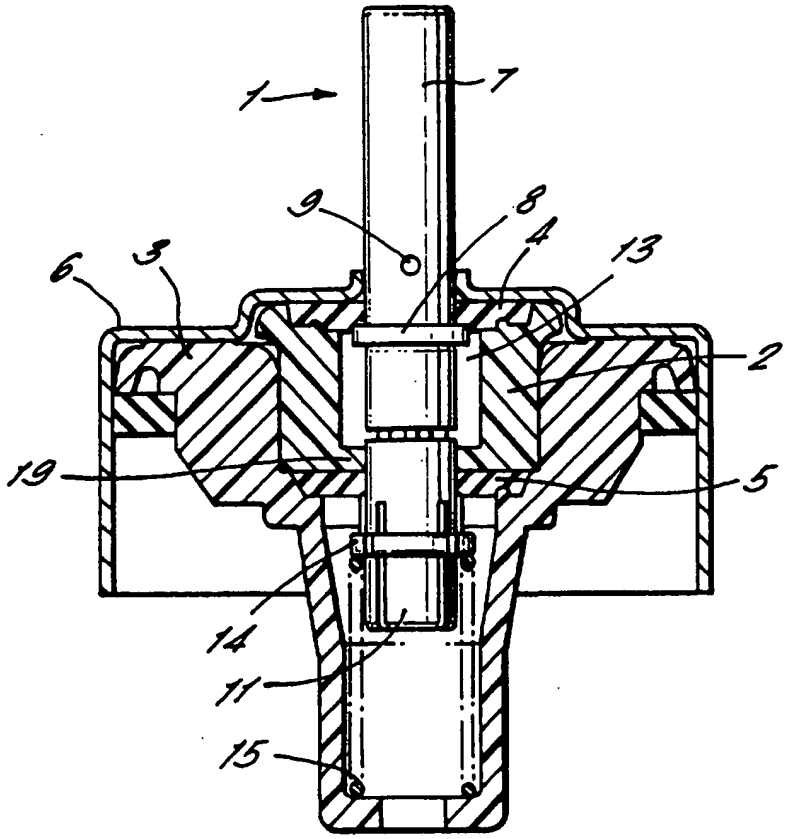

FIG. 2.

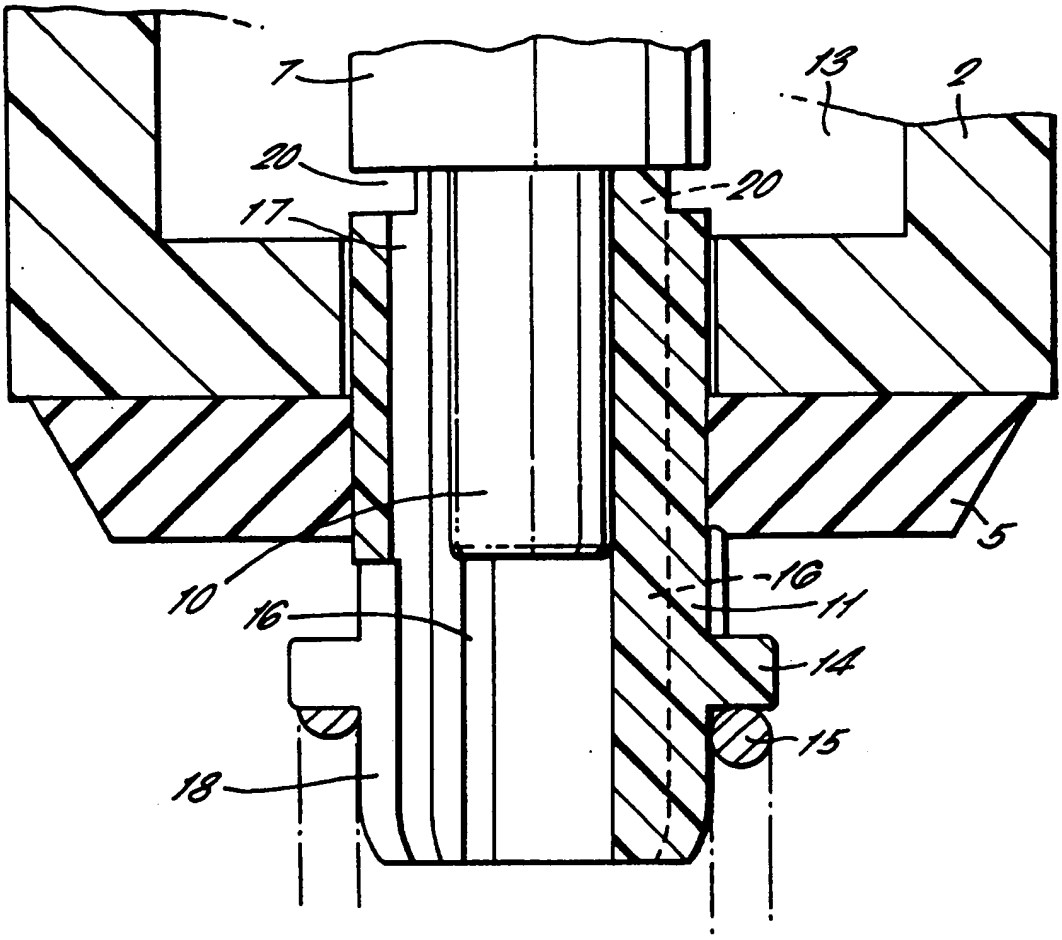
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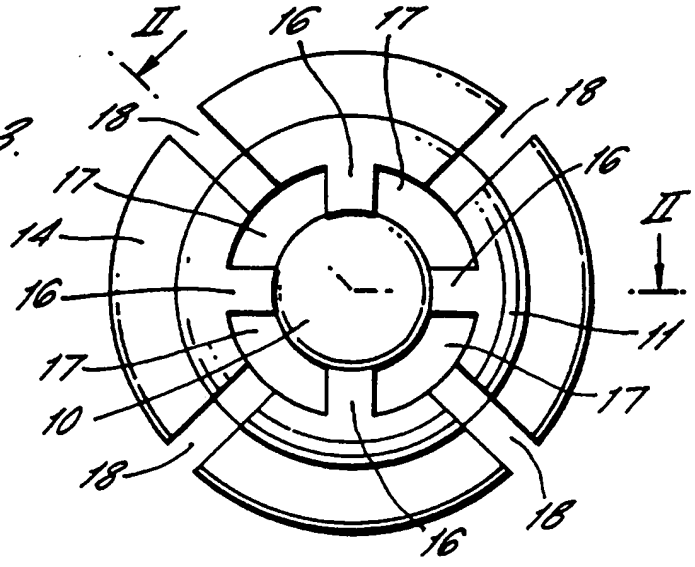
FIG. 3.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METERING VALVE

This invention relates to metering valves for pressurised dispensing containers.

Pressurised dispensing containers are typically used to dispense products in aerosol form using a propellant which is volatile at normal temperature and pressure, the product to be dispensed being mixed with liquid propellant which remains in liquid phase by virtue of excess vapour pressure within the container. Metering valves are utilised to dispense measured volumes of this liquid and comprise a metering chamber with inlet and outlet valves controlled by displacement of a valve member which defines an outlet duct.

Operation of the metering valve requires the chamber to be filled via the inlet valve, the inlet valve then closed and the outlet valve opened such that the contents are expelled by boiling off propellant in response to the chamber being vented to atmospheric pressure.

In the valve described in GB-A-1201918, once filled, the contents of the chamber is retained due to the capillary design of the small feed ports which prevent drainage of the liquid from the chamber by liquid surface tension. In other valves of this design the valve stem has a reduced section adjacent an inner seat. This type of valve suffers from the problem that as the inner seat is unsupported in the "rest" position, the entry of the valve stem into the inside diameter of the inner seat during actuation makes for a notchy valve stem action and tends to disturb the seat.

The present invention is concerned with improving the speed of the filling action of the metering

chamber when the valve is inverted, even if the contents of the chamber have previously drained back in to the container as would happen when the container is stored valve-up.

According to the present invention there is disclosed a metering valve for use in a pressurised dispensing container for dispensing a product, the metering valve comprising a valve stem having an outlet duct, said valve stem being co-axially slidable through an annular metering chamber defined between the valve stem and a cylindrical chamber body, the metering valve further comprising an inner seal operable between the valve stem and an inner end portion of the chamber body, the valve stem being slidable from a rest position, in which the metering chamber is chargeable and in which the outlet duct is sealed, to an operative position in which the contents of the metering chamber are dischargeable in use via the outlet duct, wherein said valve stem has a substantially constant diameter with flow channels for supplying, in use, product to the metering chamber defined within the valve stem, such that the inner seal is supported by the valve stem at all times.

According to the present invention there is disclosed preferably the valve stem comprises an upper section and a lower section, one of said sections extending partially into a hollow portion of the other of said sections, overlapping internal and external surfaces of which sections define said flow channels.

In a preferred embodiment of the invention each flow channel has an outlet at a point which lies within the chamber when the valve stem is in its rest position, said flow channel outlets being sealed off from the chamber by the inner seal as the valve stem moves into its operable position.

Preferably the channel outlets are provided in an angle of 90° to the direction of the channels.

More preferably the channel outlets are provided at an angle greater than 90° and less than 180° to the direction of the channels.

In another preferred embodiment the flow channels are provided by a plurality of ribs or grooves located on an internal surface of a valve stem section. Alternatively the flow channels are provided by a plurality of ribs or grooves located on an external surface of the valve stem section.

A preferred embodiment of the present invention will now be described with reference to the accompanying drawings of which:

Figure 1 is a sectional elevation of a metering valve in accordance with the present invention;

Figure 2 is a sectional elevation of a middle section of the valve of Figure 1; and

Figure 3 is a cross sectional underneath plan view of the valve stem of the valve of Figure 1 on the line III-III.

The metering valve of Figure 1 comprises a valve stem 1 which is axially slidable within an annular chamber body 2 mounted coaxially within a valve housing 3.

An outer seal 4 and an inner seal 5 of elastomeric material extend radially between the valve stem 1 and the chamber body 2.

An annular metering chamber 13 is enclosed between the chamber body 2 and the valve stem 1 and is normally sealed from the atmosphere by the outer seal

4 when the valve stem 1 is in its inoperative position (as shown in Figure 1).

(Throughout the description, unless otherwise indicated, the terms inner and outer indicate relative positions along the axis of the metering valve such that "inner" implies proximal to the container and "outer" implies distal with respect of the container.)

The outer seal 4 is radially compressed between the chamber body 2 and the valve stem 1 so as to provide positive sealing contact, the compression being achieved by dimensioning the outer seal such that it is an interference fit on the valve stem 1 or by axially compressing the outer seal by crimping a ferrule 6 which secures together the valve housing 3, the chamber body 2 and the outer seal 4 during assembly.

The valve stem 1 comprises an upper portion 7 and a lower portion 11. The upper portion 7 of the valve stem 1 is tubular and hollow and is closed internally at a location corresponding to an external radially projecting flange 8. A discharge port 9 is defined in the upper portion 7 at a location immediately above the flange 8 so as to extend radially into communication with the interior of the upper end portion.

Referring to Figure 2, it can be seen that at a proximal end of the upper portion 7 a spigot 10 is formed which is located in the distal end of the hollow lower valve stem portion 11.

As can be seen in Figures 2 and 3, the internal surface of lower valve stem portion 11 is formed with a number of ribs 16, preferably 3 or more, defining flow channels 17 therebetween. A second flange 14 is provided on the lower valve stem portion 11 and a return spring 15 extends in compression between the

valve housing 3 and the second flange 14, the bias provided by the spring 15 being operable to hold the flange 8 in sealing contact with the outer seal 4.

The proximal end of the upper valve stem portion 7 is inwardly stepped (as shown in Figure 2) or inwardly inclined at the joint with the spigot 10. The distal end of the lower valve stem portion 11 is complementarily shaped but with a gap left between the adjacent surfaces of the upper and lower valve stem portions 7 and 11 to provide an outlet 20 into the metering chamber 13.

Upon depression of the valve stem 1 relative to the valve housing 3, the metering chamber 13 is isolated from the interior of the pressurised container as the flow channel outlet 20 is covered by the inner seal 5. Upon further depression of the valve stem 1 into its operative position, the discharge port 9 moves into a position in which it communicates between the metering chamber 13 and the hollow interior of the upper end portion 7 of the valve member thereby constituting an outlet duct such that the pressurised material within the metering chamber 13 is discharged to the atmosphere by virtue of the rapid expansion of volatile propellant on being exposed to atmospheric pressure. Upon returning the valve stem 1 to its inoperative position as shown in Figures 1 and 2, but with the valve stem 1 pointing downwardly, the metering chamber 13 becomes recharged with material entering the flow channels 17 via slots 18 in the lower valve stem portion 11 and passing into the chamber 13 via outlets 20 in readiness for dispensing. If the valve is inverted (i.e. valve stem 1 pointing upwardly) the contents of the chamber 13 will drain back into the container via the flow channels 17. As soon as the valve is returned to the

valve-down position the chamber 13 fills very rapidly due to the relatively large size of the flow channels 17.

With this design of valve stem 1 with internally defined flow channels 17, it has a substantially constant external diameter and no external portions of reduced diameter, such that the inner seal 5 is supported at all times by the valve stem 1.

The number and size of flow channels 17 may be adjusted to modify the rate of chamber filling and drain back according to product formulation. A typical channel radial width, however, would be 0.5mm. The exit angle of the outlets 20 of the feed channels 17 into the chamber 13 can be altered to provide a flushing action to the sides of the chamber 13 and is preferably between 90° and 180° to the direction of the channels 17. This facilitates the removal of deposited drug from the chamber walls from previous discharges. The channel size can also be altered to assist in such cleaning.

In an alternative embodiment, the ribs 16 can be transferred to the spigot 10. In this case the size of the channel exit would need to be less than the thickness of the seat to ensure that the seal does not relax in the gap between the valve stem portions 7, 11 during the actuation stroke, thus maintaining the seat inside diameter to that of the valve stem.

CLAIMS:

1. A metering valve for use in a pressurised dispensing container for dispensing a product, the metering valve comprising a valve stem having an outlet duct, said valve stem being co-axially slidable through an annular metering chamber defined between the valve stem and a cylindrical chamber body, the metering valve further comprising an inner seal operable between the valve stem and an inner end portion of the chamber body, the valve stem being slidable from a rest position, in which the metering chamber is chargeable and in which the outlet duct is sealed, to an operative position in which the contents of the metering chamber are dischargeable in use via the outlet duct, wherein said valve stem has a substantially constant diameter with flow channels for supplying, in use, product to the metering chamber defined within the valve stem, such that the inner seal is supported by the valve stem at all times.

2. A metering valve as claimed in claim 1 in which the valve stem comprises an upper section and a lower section, one of said sections extending partially into a hollow portion of the other of said sections, overlapping internal and external surfaces of which sections define said flow channels.

3. A metering valve as claimed in claim 1 or claim 2 in which each flow channel has an outlet at a point which lies within the chamber when the valve stem is in its rest position, said flow channel outlets being sealed off from the chamber by the inner seal as the valve stem moves into its operable position.

4. A metering valve as claimed in claim 3 in which the channel outlets are provided at an angle of 90º to the direction of the channels.

5. A metering valve as claimed in claim 4 in which the channel outlets are provided at an angle greater than 90º and less than 180º to the direction of the channels.

6. A metering valve as claimed in any one of the preceding claims in which the flow channels are provided by a plurality of ribs or grooves located on an internal surface of a valve stem section.

7. A metering valve as claimed in any one of claims 1 to 5 in which the flow channels are provided by a plurality of ribs or grooves located on an external surface of a valve stem section.

8. A metering valve substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

The Patent Office

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Application No: GB 9723393.6 **Examiner:** Steve Waller
Claims searched: 1-8 **Date of search:** 6 February 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): B8N NKB

Int Cl (Ed.6): B65D 83/14

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2 312 418 A	(Bespak Plc) See figure 1	1,2,3,4,7
X	GB 2 307 224 A	(Bespak Plc) See figure 1	1,3,4
X	GB 2 216 872 A	(Meshberg) See figure 6	1,3,7
X	GB 2 195 986 A	(Glaxo) See figure 2	1,3,4
X	EP 0 692 434 A2	(V.A.R.I.) See figure 1	1,2,3,4,7
X	EP 0 642 992 A2	(CIBA GEIGY) See figure	1,2,3,4,7
X	US 5 169 038	(Valois) See figures 1 to 7	1,2,3,4, 6,7
X	US 4 842 168	(Societe Francaise d'Aerosol et de Bouchage) See figures 1 and 2	1,3,7

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.